

Original article

# Attitudes of students of a health sciences university towards the extension of smoke-free policies at the university campuses of Barcelona (Spain)



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## ABSTRACT

**Objective:** To assess attitudes towards the extension of outdoor smoke-free areas on university campuses. **Methods:** Cross-sectional study (n = 384) conducted using a questionnaire administered to medical and nursing students in Barcelona in 2014. Information was obtained pertaining to support for indoor and outdoor smoking bans on university campuses, and the importance of acting as role models. Logistic regression analyses were performed to examine agreement.

**Results:** Most of the students agreed on the importance of health professionals and students as role models (74.9% and 64.1%, respectively) although there were statistically significant differences by smoking status and age. 90% of students reported exposure to smoke on campus. Students expressed strong support for indoor smoke-free policies (97.9%). However, only 39.3% of participants supported regulation of outdoor smoking for university campuses. Non-smokers (OR = 12.315; 95% CI: 5.377–28.204) and students  $\geq 22$  years old (OR = 3.001; 95% CI: 1.439–6.257) were the strongest supporters.

**Conclusions:** The students supported indoor smoke-free policies for universities. However, support for extending smoke-free regulations to outdoor areas of university campuses was limited. It is necessary to educate students about tobacco control and emphasise their importance as role models before extending outdoor smoke-free legislation at university campuses.

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## Actitudes de los estudiantes de una universidad de ciencias de la salud sobre la extensión de las políticas de espacios sin humo en los campus universitarios de Barcelona (España)

## RESUMEN

**Objetivo:** Evaluar las actitudes hacia la extensión de las políticas de campus exteriores sin humo.

**Métodos:** Estudio transversal (n = 384) mediante cuestionario administrado a estudiantes de enfermería y medicina de Barcelona en 2014. Se obtuvo información sobre el apoyo a los recintos universitarios sin tabaco (interior y exterior) y el acuerdo con el rol ejemplar. Se realizaron análisis de regresión logística para examinar el acuerdo.

**Resultados:** La mayoría de los estudiantes están de acuerdo en la importancia del rol ejemplar de los profesionales y de los estudiantes sanitarios (74,9% y 64,1%, respectivamente), aunque hay diferencias estadísticamente significativas por edad y consumo de tabaco. El 90% afirman estar expuestos al tabaco en el campus. Existe un gran apoyo a los espacios interiores libres de humo (97,9%), pero solo el 39,3% apoya la regulación de los espacios exteriores en el campus; los no fumadores (*odds ratio* [OR] = 12,315; intervalo de confianza del 95% [IC95%]: 5,377–28,204) y el grupo de  $\geq 22$  años de edad (OR = 3,001, IC95%: 1,439–6,257) expresaron el mayor apoyo.

**Conclusiones:** Los estudiantes apoyan las prohibiciones de consumo de tabaco en los espacios interiores de las universidades. Existe un apoyo limitado para extender la regulación de espacios sin humo a los exteriores de los campus universitarios. Es necesario sensibilizar a los estudiantes sobre el control del tabaco y fomentar su rol ejemplar antes de extender la legislación de espacios exteriores.

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### Palabras clave:

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## Introduction

Smoke-free laws are an important instrument in tobacco control to protect people from the hazards of secondhand smoke (SHS)<sup>1,2</sup> and to reduce smoking consumption rates, especially among young adults.<sup>3</sup> Since the approval of the World Health Organization Framework Convention for Tobacco Control (WHO-FCTC) in 2003, many countries have introduced policies to restrict smoking in indoor public places and workplaces, including health care and educational locations.<sup>2</sup> However, research has demonstrated that despite the existence of indoor regulation, non-smokers continue to be exposed to SHS in outdoor areas where smoking is still allowed,<sup>4,5</sup> mainly because smokers have moved outdoors due to indoor smoking bans.<sup>6</sup> SHS exposure in outdoor locations will decrease when a more restrictive regulation comes into force<sup>7</sup> and smoking prevalence will drop, especially among the youth.<sup>8</sup>

High concentrations of outdoor SHS are determined by the density of smokers, the creation of semi-open places, a lack of wind and the presence of stable atmospheric conditions.<sup>9</sup> The presence of nitrosamines and particulate matter  $\leq 2.5 \mu\text{m}$  in diameter (PM<sub>2.5</sub>) has been found in both open and semi-open places,<sup>9,10</sup> with the associated risks for health. Besides health concerns, there are other reasons to support the prohibition of outdoor smoking such as reducing the litter, decreasing fire risks, and, most importantly, establishing a positive smoke-free model for youth in order to reduce imitative behavior.<sup>11</sup>

In Spain, 28.6% of young adults aged 18 to 24 years old are enrolled in university-level degree programs.<sup>12</sup> Universities, especially those that offer degree programs in health-related disciplines, can contribute to the health of the wider community by setting an example of good practice and banning smoking from their premises.<sup>13</sup> Similarly, university health professional students (HPS) should act as role models for their patients, and acquire knowledge and skills to assist their patients stop smoking.<sup>14</sup>

Previous studies have demonstrated that university smoke-free policies are associated with a drop in student smoking rates<sup>15</sup> and with fewer students reporting exposure to SHS or seeing someone smoke on campus.<sup>16</sup> These studies have been conducted in the United States (US), where tobacco-free campus policies are a growing trend as of October 2015, 1,620 US universities were 100% smoke-free campuses.<sup>17</sup>

In many European countries outdoor smoke-free regulation are less prevalent, and limited mainly to primary and secondary schools.<sup>2</sup> Since the year 2011, Spain has had one of the most comprehensive smoke-free regulations indoors; in addition, the current legislation also restricts smoking in some outdoor public areas including hospital premises, primary and secondary school grounds and playgrounds.<sup>18</sup> Nevertheless, the existing ban does not prohibit smoking on university campuses. As a result, entrances areas and outdoor areas in near proximity to these entrances often concentrate numerous smokers, which could represent a health risk for non-smokers due to ongoing exposure to SHS over times.<sup>7</sup> A study conducted in Barcelona found that 90% of university students reported being exposed to SHS in outdoor areas of their university campuses.<sup>5</sup>

In the last 20 years, smoking rates have decreased substantially among Spanish adults (aged 16 to 24 years old) –from 32.1% in 1993<sup>19</sup> to 24.7% in 2013<sup>20</sup>–; however, these rates are still high when compared to other developed countries such as the US (18.7%)<sup>21</sup> or Australia (18.5%).<sup>22</sup> According to studies published in the same period (1997 to 2016), smoking prevalence among HPS in Spain ranged from 38.7%<sup>23</sup> to 18.2%<sup>24</sup> among nursing students, and from 27.0%<sup>25</sup> to 15.7%<sup>26</sup> among medical students.

Given that the process of adopting smoke-free legislation requires strong political will and population support, it is essential

to determine student support before implementing outdoor smoke-free policies at university campuses. The current legislation means that HPS have become one of the university student groups most affected by smoke-free regulations in Spain. Mainly because medical and nursing faculties are often located near acute care hospitals and, of course, these students spend much of their practical training in such facilities. As a result, they are affected by both indoor and outdoor smoking bans. This is the case at the Universitat Internacional de Catalunya (UIC) Health Professions Campus, which is located adjacent to an acute care hospital, although both institutions have separate main entrances.

In this context, we sought to investigate whether HPS are influenced by outdoor smoking bans in hospitals and also whether they agree with extending smoking regulations to outdoor campus areas. Our main aims were to identify the factors that influence these students in having a more favorable attitude towards outdoor smoking bans and to ascertain support for such policies.

## Methods

### *Design and participants*

This is a cross-sectional study conducted at the Faculty of Medicine and Health Sciences at the Universitat Internacional de Catalunya (UIC), located in Barcelona (Spain).

Participants were students from the Nursing and Medicine degree courses at the UIC who were enrolled in classes during the first quarter of the 2014–2015 academic year. For inclusion, subjects were required to meet the following criteria: 1) enrolled in the nursing or medicine degree program, 2) age  $\geq 18$  years during the 2014 academic year, and 3) registered in the class in which the study data were collected. Students in practical training during the study period were excluded due to difficulties in reaching them. Consequently, we included nursing students from the 1st to 3rd year of school, and medical students from the 1st to 4th year.

### *Instrumentation*

An anonymous, self-administered questionnaire based on the Global Health Professions Student Survey (GHPSS) was designed to be administered during regular class hours. This questionnaire included questions covering tobacco use, SHS exposure, enforcement of smoking bans, attitudes and beliefs towards tobacco control activities, and agreement with the health professionals (HP) and HPS' role.<sup>27</sup>

To collect information about “compliance with the smoke-free campus ban”, “agreement with the smoking ban” and “exposure to SHS”, we differentiated between indoor and outdoor areas. Each of the questions had five response options (ranging from “totally agree” to “totally disagree”). For purposes of this study, responses were recalculated into two dichotomous answers (agreement = totally agree and agree, and non-agreement = not agree, not disagree, disagree, totally disagree). We also collected data on participants' demographic characteristics, including sex (male or female), age group ( $\leq 18$  years old, age 19–21,  $\geq 22$  years old), degree (medicine or nursing) and degree program year (1, 2, 3, 4). For this paper, the main independent variables were smoking status<sup>28</sup> [classified as smokers (including daily and occasional smokers) and non-smokers (including both former smokers not smoking for 6 months or longer, and never smokers)], degree, sex, and age group. We ruled out degree program as independent variable for performing the analysis because it was highly correlated with age group.

Procedure

Prior to questionnaire distribution, all students were informed about the main objectives of the study and all provided informed consent for their voluntary participation.

The final study sample was composed of 384 students, a response rate of 74.3% (384/517) of the students enrolled. All students that were in class on the day of the survey, voluntary participated in the study. Participation among medical students was slightly higher than among nursing students [81.1% (253/312) vs 64.0% (131/205)]. Medical students accounted for 65.9% (253/384) of participants, with nursing students accounting for 34.1% (131/384) of the final sample. Females were more represented than males in both degree programs, although the proportion of females in the nursing degree was significantly higher (79.5% vs. 66.0%;  $p < 0.001$ ). In the final sample, 70.6% ( $n = 272$ ) were females and 29.4% ( $n = 112$ ) were males, and females had a higher participation rate than males (83.6% vs 58.3%).

Data analysis

We computed prevalence rates (%) and corresponding 95% confidence intervals (95%CI). For the bivariate analysis we use Chi square test or the Fisher exact statistic when one or more of cells had an expected frequency of 5 or less, with  $p < 0.05$  as statistical significant threshold. Students were categorized into three age groups and the Chi square test was used to assess for the linear trend. Logistic regression analyses for attitudes concerning students' support to smoke-outdoor campuses and their agreement with the exemplarity role were performed, after controlling for smoking status, sex, degree and age group. Odds ratios (OR) and 95%CI were calculated. We selected these attitudes because we focus the study in the evaluation of attitudes towards smoke-free outdoors and exemplarity role which were conceptually considered the most relevant for answering our research question. The statistical analysis was performed with the statistical package SPSS 21.0 for Windows.

Results

Smoking status

Overall, 23.4% of responders were smokers. By degree, 17.5% of medicine students smoked vs 35.1% of nursing students ( $p \leq 0.001$ ). By sex, 25.2% of men and 22.9% of women were smokers. By age, 34.7% of those  $\geq 22$  years old were smokers, whereas 20.0% of  $\leq 18$  years, and 21.2% of 19-21 years were ( $p$  for trend = 0.034).

Agreement with health professionals' role in tobacco control by independent variables

Table 1 summarizes students' agreement with several tobacco control statements including HP' and HPS' role. Nearly three-quarters (74.9%) of the students agreed that HP should set an example by not smoking. Only 58.6% of smokers agreed with this statement vs 79.7% of non-smokers ( $p < 0.001$ ). Similarly, a smaller percentage of students in the youngest age group ( $\leq 18$  years old) agreed with this statement compared to those in older age groups ( $p$  for trend = 0.004). When students were asked about their own role in setting an example 64.1% agreed. Smokers and the youngest students expressed lower support (statistically significant in both cases:  $p < 0.005$ ) about the importance of setting an example. Finally, 54.4% of the students believed that tobacco cessation treatments should be included in the National Health System (NHS), with nursing students demonstrating significantly greater support for this policy than medical students (69.7% vs 46.9%,  $p < 0.001$ ).

Compliance with smoke-free policies and exposure to second-hand smoke in indoor and outdoor areas

Table 1 Student agreement with the role of health professionals and health professional students in tobacco control by independent variables.

	Overall n = 384 % (95%CI)	Smokers <sup>a</sup>		Health Science <sup>a</sup>		Sex <sup>a</sup>		Age <sup>a</sup>			p for trend
		Yes n = 90 % (95%CI)	No n = 293 % (95%CI)	Medicine n = 253 % (95%CI)	Nursing n = 131 % (95%CI)	Male n = 112 % (95%CI)	Female n = 272 % (95%CI)	$\leq 18$ years old n = 100 % (95%CI)	19-21 years old n = 209 % (95%CI)	$\geq 22$ years old n = 75 % (95%CI)	
		p	p	p	p	p	p	p	p	p	
HP should set an example and not smoke	74.9 (70.5-79.2)	58.6 (53.7-63.5)	79.7 (75.6-83.7)	69.4 (61.5-77.3)	71.3 (62.9-79.6)	76.2 (71.1-81.3)	62.2 (52.7-71.7)	79.4 (73.9-84.8)	79.5 (70.3-88.6)	0.004	
HPS should set an example and not smoke	64.1 (59.3-68.8)	46.0 (41.0-50.9)	69.6 (64.9-74.2)	58.1 (49.5-66.5)	59.6 (50.5-68.6)	65.9 (60.3-71.5)	55.1 (45.3-64.8)	65.8 (59.3-72.2)	72.2 (62.1-82.3)	0.010	
HP should know how to help smokers to quit	97.0 (97.3-98.7)	98.9 (97.8-99.9)	96.4 (94.5-98.3)	96.8 (93.4-99.8)	96.3 (92.8-99.2)	97.3 (95.3-99.2)	93.8 (89.1-98.5)	98.0 (96.1-99.9)	98.6 (95.9-100)	0.091	
The NHS should fund TC treatments	54.4 (49.4-59.4)	59.8 (54.9-64.7)	52.9 (47.9-57.9)	69.7 (61.8-77.6)	50.0 (40.7-59.3)	56.3 (50.4-62.2)	48.4 (38.6-58.1)	53.3 (46.5-60.1)	65.8 (55.0-76.5)	0.022	

95%CI: confidence interval of 95%; HP: health professionals; HPS: health professional students; NHS: National Health System; TC: tobacco control.  
<sup>a</sup> Missing data.

Nearly all students (97.9%) agreed that indoor campuses should be smoke-free. By contrast, only 39.3% supported banning smoking in outdoor areas of university campuses with non-smokers significantly more supportive of such a ban compared to smokers (48.8% vs 8.1%;  $p < 0.001$ ) (Table 2).

A high percentage of students (87.0%) reported believing that the university complies with the indoor smoking ban, but only 12.2% agreed about the compliance with the outdoor ban. Compared to nursing students, a significantly higher percentage of medical students believed that the outdoor ban is respected (8.5% vs 18.9%;  $p = 0.006$ ).

In addition, 8.1% of the students reported that they had not been exposed to SHS on campus during the prior week. The majority (89.3%) were exposed in outdoor areas, without differences among students' degree and sex. Smokers reported higher exposure to SHS than non-smokers (98.9% vs 87.0%;  $p < 0.001$ ) (Table 3).

*Factors associated with exemplary role and smoke-free outdoor campuses*

Table 4 summarizes HPS' factors associated with having positive attitudes towards tobacco control (including exemplarity role and agreement with smoke-free outdoor campuses) after running a logistic regression model (that controls by sex, age, degree, and smoking status). Compared to smokers, non-smokers were more likely to believe that HP (OR = 2.854; 95%CI: 1.651–4.936) and HPS should set an example by not smoking (OR = 2.755; 95%CI: 1.642–4.624). In addition, compared to younger students, a higher percentage of older students believed in the importance of HPS and HP setting an example.

Non-smoking students were 12 times more likely than non-smokers to believe that smoking should be prohibited in outdoor areas of the campus (OR = 12.315; 95%CI: 5.377–28.204). Older students were more likely to support outdoor smoking bans: students in the 19–20 years old age group were twice as likely support outdoor smoking bans than younger students (OR = 2.085; 95%CI: 1.199–3.624); students in the oldest age group ( $\geq 22$  years) were three times more likely than younger students to support the ban (OR = 3.001; 95%CI: 1.439–6.257).

**Discussion**

This is the first study to explore HPS attitudes about compliance with indoor and outdoor smoke-free policies on university campuses in Spain among HPS. Our results show that four years after a comprehensive smoke-free law was passed in Spain, support among HPS for extending smoke-free policies to outdoor areas of university campuses is low. Non-smokers and older age groups were more likely to positive attitudes about tobacco control in terms of agreeing with the need to: 1) set a good example and by not smoking and 2) pass outdoor smoking bans.

In our study, only 40% of student participants agreed with the notion of extending smoke-free policies to outdoor areas of the campus. A previous study conducted in the Washington state - where a smoke-free campus policy was in place- showed that 72.0% of students supported the policy.<sup>29</sup> Although there were several notable differences between our study and the Washington one in terms of the results, in both studies non-smokers showed greater support than smokers for outdoor smoke-free regulation. A previous study conducted at Tennessee State University suggests that, before implementing outdoor smoking bans, it would be beneficial to identify sub-groups that are more receptive towards such measures in order to leverage this support to promote positive attitudes towards change in current smoking policies.<sup>30</sup>

**Table 2** Agreement with the compliance of the smoke-free campus ban and support for indoor and outdoor smoke-free policies.

	Overall n = 384 %	Smokers <sup>a</sup>		p	Health science <sup>a</sup>		Sex <sup>b</sup>		Age <sup>a</sup>			p for trend
		Yes n = 90 % (95%CI)	No n = 293 % (95%CI)		Medicine n = 253 % (95%CI)	Nursing n = 131 % (95%CI)	Male n = 112 % (95%CI)	Female n = 272 % (95%CI)	$\leq 18$ years old n = 100 % (95%CI)	19–21 years old n = 209 % (95%CI)	$\geq 22$ years old n = 75 % (95%CI)	
Smoking should be forbidden in the indoor area in the UC	97.9 (96.4–99.3)	96.6 8.1	98.3 48.8	0.397 <sup>b</sup>	97.6 42.6	98.5 33.3	98.9 46.8	95.5 36.1	97.0 27.8	99.0 43.2	96.0 44.4	0.782
Smoking should be forbidden in the outdoor areas in the UC	87.0 (34.4–44.1)	88.5 88.5	86.5 (43.1–54.5)	<0.001 <sup>b</sup>	87.3 (36.5–48.7)	86.8 (25.2–41.3)	87.0 (37.5–56.0)	86.8 (30.4–41.8)	91.6 (19.0–36.6)	87.1 (36.4–49.9)	80.8 (33.1–55.5)	0.019
The University complies with the smoke-free indoor ban	12.2 (83.6–90.3)	8.3 (81.9–95.1)	13.3 (826–90.4)	0.221	8.5 (83.2–91.4)	18.9 (81.0–92.6)	10.5 (80.7–93.2)	12.8 (82.7–90.8)	12.8 (86.1–97.0)	10.6 (82.5–91.6)	14.3 (71.8–89.7)	0.983
The University complies with the smoke-free outdoor ban	(8.9–15.5)	(2.6–13.9)	(9.4–17.2)		(5.0–11.9)	(12.2–25.6)	(4.8–16.2)	(8.8–16.7)	(6.2–19.3)	(6.4–14.7)	(6.3–22.2)	

95%CI: confidence interval of 95%; UC = University Campus.

<sup>a</sup> Missing data.

<sup>b</sup> Fisher exact statistic.

**Table 3**  
Percentage of students who have been exposed to second hand smoke on campus within the prior 7 days.

	Overall		Smokers <sup>a</sup>		Health science <sup>a</sup>		Sex <sup>a</sup>		Age <sup>a</sup>			p for trend
	n = 384 %	Yes n = 87 (95%CI)	No n = 280 (95%CI)	P	Medicine n = 246 (95%CI)	Nursing n = 124 (95%CI)	Male n = 107 (95%CI)	Female n = 261 (95%CI)	P	≤18 years old n = 100 (95%CI)	19-21 years old n = 207 (95%CI)	
Never exposed	8.1 (5.3-10.8)	0 (0-4.2)	10.3 (6.7-13.8)	<0.001	7.5 (4.2-10.8)	9.2 (4.1-14.3)	7.1 (2.5-11.6)	8.5 (5.1-11.9)	0.837	10.0 (5.5-17.4)	8.7 (4.8-12.5)	0 (0-4.8)
Indoor	2.6 (1.0-4.2)	0 (0-4.2)	2.7 (0.8-4.7)	0.692	0 (0-1.5)	3.2 (0.1-6.3)	0 (0-1.4)	3.0 (0.9-5.1)	0.730	0 (0-3.7)	3.3 (0.8-5.7)	0 (0-4.8)
Outdoor	89.3 (86.2-92.4)	98.9 (92.0-99.3)	87.0 (83.0-90.9)	<0.001	89.3 (85.4-93.1)	89.3 (83.4-94.7)	91.1 (10.1-18.4)	88.6 (84.7-92.5)	0.586	90.0 (84.1-95.8)	88.0 (85.6-94.4)	92.1 (85.6-98.2)

<sup>a</sup> Missing data.

In our study, we included several independent variables including smoking status, age, sex, and degree to check for differences between sub-groups. We found that a higher percentage of nursing students smoked compared to medical students (35.1% vs 17.5%;  $p < 0.001$ ). For this reason, our adjusted model included area of study apart from other sociodemographic variables. Our results suggest that smoking and being in the young age ( $\leq 18$  years) were associated with lower support for tobacco control measures. As previously reported, both Spanish nursing students<sup>31</sup> and medical students<sup>25</sup> are unaware about their own role when they are smokers. In this sense, it was interesting to observe that in our model HPS' support of tobacco control was associated mainly with smoking status and age, rather than the health science degree studied. This imply that if measures were implemented to reduce smoking consumption among all students enrolled in Health Science degrees, then agreement in favor of tobacco control policies would probably increase.

Our findings regarding exposure to SHS are consistent with a previous study<sup>6</sup> and also help to explain low compliance with outdoor smoke free policies. In the US compliance with SHS and acceptance of outdoor smoking bans has increased over time.<sup>16,28</sup> In Spain, the lack of specific regulations for university Health Professions Campuses means that HPS are largely unaware of the benefits of outdoor smoking ban in place at hospitals. However, research has shown that the more frequently such policies are adopted, the higher the compliance and support.<sup>32</sup>

WHO-FCTC suggests that national bodies and organizations should protect the population from the hazards of SHS 'wherever the evidence shows that hazard exists', including quasi-outdoor and outdoor places.<sup>33</sup> However, the adoption of smoke-free legislation in any setting requires strong population support to achieve a high degree of compliance. Meanwhile, several measures can be undertaken to facilitate implementation and improve compliance. For instance, the Tobacco-Free College Campus Initiative proposes actions that could improve motion, such as improving the communication channels, improving signage, reinforcing compliance surveillance, maintaining grounds litter-free, and so on.<sup>34</sup>

Our results seem to point out future directions that university administrators and undergraduate health science' educators could take to advance the implementation of tobacco-free universities in Spain. Firstly, Spanish University Associations should adopt comprehensive smoke-free policies that included a similar to the one approved by the American College Health Association in 2009<sup>17</sup> that included a package of measures to facilitate implementation. Secondly, university educators should provide specific training techniques for preventing and controlling tobacco use. Lastly, specific actions should be undertaken by universities to promote protection from SHS and encourage smoking cessation. In our context, a previous study has proven that multicomponent intervention tailored to university students obtains high abstinence rates at 6 months.<sup>35</sup> Although, such initiatives are still uncommon, Spanish universities should provide tobacco cessation services to reduce high smoking prevalence rates.<sup>24-26</sup>

This study has limitations, mostly due to the use of a self-administered questionnaire, which can lead to social desirability bias. We attempted to minimize these limitations by basing our questionnaire on a previous questionnaire used in similar populations.<sup>27</sup> In addition, data on SHS exposure was self-reported and we did not use biomarkers to detect exposure; as a result, participants may have underestimated their exposure. However, since we only sought to explore whether the HPS were exposed or not to SHS during their time on campus precise levels of exposure were not required. Another limitation is the cross-sectional study design; moreover, our study is the difficulty in extrapolating results to other Spanish Universities given that UIC is a private university, and it is quite probably that students at UIC have a higher socioeconomic

**Table 4**  
Factors associated with some tobacco control attitudes and beliefs among tobacco control.

Dependent variable	HP should set example and not smoke		HPS should set an example and not smoke		Smoking should be forbidden in the outdoor areas of the UC		The University complies with smoke-free outdoor smoking ban	
	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p
<i>Sex</i>								
Male	Ref.	0.119	Ref.	0.113	Ref.	0.631	Ref.	0.891
Female	1.541 (0.895–2.654)		1.491 (0.910–2.445)		0.6381 (0.381–1.046)		1.054 (0.499–2.227)	
<i>Age</i>								
≤18 years old	Ref.		Ref.		Ref.		Ref.	
19–21 years old	2.484 (1.420–4.344)	0.001	1.611 (0.962–2.698)	0.070	2.085 (1.199–3.624)	0.090	0.807 (0.379–1.718)	0.578
≥22 years old	3.401 (1.585–7.300)	0.001	3.074 (1.505–6.277)	0.002	3.001 (1.439–6.257)	0.030	0.896 (0.354–2.264)	0.816
<i>Health science</i>								
Medicine	Ref.	0.137	Ref.	0.064	Ref.	0.511	Ref.	0.030
Nursing	0.659 (0.381–1.142)		0.622 (0.377–1.028)		0.839 (0.498–1.415)		2.830 (1.427–5.613)	
<i>Smoking</i>								
Yes	Ref.	<0.001	Ref.	<0.001	Ref.	<0.001	Ref.	0.079
No	2.854 (1.651–4.936)		2.755 (1.642–4.624)		12.315 (5.377–28.204)		2.192 (0.914–5.631)	

HP: health professionals; HPS: health professional students; UC: university campus. Method used for the logistic regression: ENTER.

status. We did not assess socioeconomic status, which would have been useful to adjust the analysis for this variable. Finally, we cannot rule out selection bias given that 25% of registered students did not attend class on the day the survey was conducted. It is plausible that absent students had different attitudes and opinions about tobacco control. Nevertheless, we expect that our results may be similar to those obtained at other Health Science Universities due similarities in curriculum.

In conclusion, support to extend such bans to outdoor areas of university campuses is limited. Non-smokers and older students expressed moderate levels of support. Our findings indicate that, before smoke-free regulations are extended to outdoor areas, it is necessary to educate students on the importance of tobacco control and to persuade them to set an example for other students and patients. These aims can be achieved by promoting smoking cessation among smokers and convincing HPS to act as role models by not smoking. Future research should include the implementation of initiatives that include a range of actions- including outdoor bans- similar to those proposed by the Tobacco-Free College Campus Initiative. Pilot programs should be undertaken to evaluate the impact and success of such measures, with the ultimate aim of extending smoke-free policies to all university campus.

#### Editor in charge

Miguel Ángel Negrín Hernández.

#### Transparency declaration

The corresponding author on behalf of the other authors guarantee the accuracy, transparency and honesty of the data and information contained in the study, that no relevant information has been omitted and that all discrepancies between authors have been adequately resolved and described.

#### What is known about the topic?

Research has demonstrated that non-smokers are exposed to secondhand smoke in outdoor areas where smoking is allowed. Outdoor smoke-free policies at universities are associated with a drop in student smoking rates and less exposure to secondhand smoke.

#### What does this study add to the literature?

The level of support among nursing and medical students for extending outdoor smoking bans to university campuses is limited. These findings suggest that it is necessary to better educate students about tobacco control and engage them in assuming their exemplary role.

#### Authorship contributions

C. Martínez and J.M. Martínez-Sánchez conceived the project. C. Martínez coordinated the field work. C. Méndez and M. Sánchez piloted the questionnaire and conducted the field work. All authors have co-designed the survey. C. Martínez executed the analysis and drafted the first manuscript. All authors read and commented the final version of this manuscript.

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#### Conflicts of interests

None.

#### References

1. IARC Working Group. Evaluating the effectiveness of smoke-free policies. In: IARC handbooks of cancer prevention: tobacco control. Lyon: IARC; 2009.
2. Martínez C, Martínez-Sánchez JM, Robinson G, et al. Protection from secondhand smoke in countries belonging to the WHO European Region: an assessment of legislation. *Tob Control*. 2014;23:403–11.
3. Song AV, Dutra LM, Neilands TB, et al. Association of smoke-free laws with lower percentages of new and current smokers among adolescents and young adults: an 11-year longitudinal study. *JAMA Pediatr*. 2015;169:e152285.

4. Licht AS, Hyland A, Travers MJ, et al. Secondhand smoke exposure levels in outdoor hospitality venues: a qualitative and quantitative review of the research literature. *Tob Control.* 2013;22:172–9.
5. Sureda X, Martínez-Sánchez JM, Fu M, et al. Impact of the Spanish smoke-free legislation on adult, non-smoker exposure to secondhand smoke: cross-sectional surveys before (2004) and after (2012) legislation. *PLoS One.* 2014;9:e89430.
6. Sureda X, Fernández E, Martínez-Sánchez JM, et al. Secondhand smoke in outdoor settings: smokers' consumption, non-smokers' perceptions, and attitudes towards smoke-free legislation in Spain. *BMJ Open.* 2015;5: e007554-2014-007554.
7. Hyland A, Barnoya J, Corral JE. Smoke-free air policies: past, present and future. *Tob Control.* 2012;21:154–61.
8. U.S. Department of Health and Human Services. Preventing tobacco use among youth and young adults: a report of the Surgeon General. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2012. Available at: <http://www.surgeongeneral.gov/library/reports/preventing-youth-tobacco-use/full-report.pdf>.
9. Sureda X, Fernández E, López MJ, et al. Secondhand tobacco smoke exposure in open and semi-open settings: a systematic review. *Environ Health Perspect.* 2013;121:766–73.
10. Vardavas CI, Karabela M, Agaku IT, et al. Secondhand smoke exposure within semi-open air cafes and tobacco specific 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol (NNAL) concentrations among nonsmoking employees. *Int J Occup Med Environ Health.* 2014;27:875–81.
11. Chapman S. Should smoking in outside public spaces be banned? No. *BMJ.* 2008;337:a2804.
12. Ministerio de Educación, Cultura y Deporte. Datos y cifras del sistema universitario español. Curso 2014-2015. 2015. (Accessed 03/01/2016.) Available at: <http://www.mecd.gob.es/dms/mecd/educacion-mecd/areas-educacion/universidades/estadisticas-informes/datos-cifras/Datos-y-Cifras-del-SUE-Curso-2014-2015.pdf>
13. Duaso MJ, De Irala J, Canga N. Employee's perceived exposure to environmental tobacco smoke, passive smoking risk beliefs and attitudes towards smoking: a case study in a university setting. *Health Educ Res.* 2006;21:26–33.
14. Do YK, Bautista MA. Medical students' tobacco use and attitudes towards tobacco control. *Med Educ.* 2013;7:607–16.
15. Seo DC, Macy JT, Torabi MR, et al. The effect of a smoke-free campus policy on college students' smoking behaviors and attitudes. *Prev Med.* 2011;53:347–52.
16. Fallin A, Roditis M, Glantz SA. Association of campus tobacco policies with secondhand smoke exposure, intention to smoke on campus, and attitudes about outdoor smoking restrictions. *Am J Public Health.* 2015;105:1098–100.
17. The American Nonsmokers' Rights Foundation. Tobacco free campus. (Accessed 12/12/2015.) Available at: <http://tobaccofreecampus.org/campus-list-progress>
18. Ley 42/2010, por la que se modifica la Ley 28/2005, de 26 de diciembre, de medidas sanitarias frente al tabaquismo y reguladora de la venta, el suministro, el consumo y la publicidad de los productos del tabaco. BOE número 318, de 31/12/2010, p. 109188-9194B.
19. Ministerio de Sanidad, Servicios Sociales e Igualdad. Instituto Nacional de Estadística. Encuesta Nacional de Salud de España 2011/12. (Accessed 06/03/2013.) Available at: <http://www.msc.es/estadEstudios/estadisticas/encuestaNacional/encuesta2011>
20. Departament de Salut. Programa per a la prevenció i el control del tabaquisme. Enquesta de consum de tabac, alcohol i drogues, 1998. Enquesta de Salut de Catalunya 2002, 2006, 2011, 2012 i 2013. Available at: <http://www.idescat.cat/pub/?id=aec&n=820>.
21. Jamal A, Agaku IT, O'Connor E, et al. Current cigarette smoking among adults - United States, 2005-2013. *MMWR Morb Mortal Wkly Rep.* 2014;63:1108–12.
22. Australian Institute of Health and Welfare. National Drug Strategy Household Survey detailed report: 2013. *Rug Statistics Series.* 2014;PHE 183(28).
23. Heras Tebar A, García Sanchón C, Hernández Lopez MC, et al. Smoking among nursing students in Catalonia: knowledge, attitudes and practice. *Gac Sanit.* 1997;11:267–73.
24. Ordás B, Fernández D, Ordoñez C, et al. Changes in use, knowledge, beliefs and attitudes relating to tobacco among nursing and physiotherapy students: a 10-year analysis. *J Adv Nurs.* 2015;71:2326–37.
25. Mas A, Nerín I, Barrueco M, et al. Smoking habits among sixth-year medical students in Spain. *Arch Bronconeumol.* 2004;40:403–8.
26. La Torre G, Kirch W, Bes-Rastrollo M, et al. Tobacco use among medical students in Europe: results of a multicentre study using the Global Health Professions Student Survey. *Public Health.* 2012;126:159–64.
27. Warren CW, Sinha DN, Lee J, et al. Tobacco use, exposure to secondhand smoke, and cessation counseling among medical students: cross-country data from the Global Health Professions Student Survey (GHPSS), 2005-2008. *BMC Public Health.* 2011;11, 72-2458-72.
28. Hughes JR, Keely JP, Niaura RS, et al. Measures of abstinence in clinical trials: issues and recommendations. *Nicotine Tob Res.* 2003;5:13–25.
29. Braverman MT, Hoogesteger LA, Johnson JA. Predictors of support among students, faculty and staff for a smoke-free university campus. *Prev Med.* 2015;71:114–20.
30. Mamudu HM, Veeranki SP, Kioko DM, et al. Exploring support for 100% college tobacco-free policies and tobacco-free campuses among college tobacco users. *J Public Health Manag Pract.* 2016;22:29–39.
31. Pericas J, González S, Bannasar M, et al. Cognitive dissonance towards the smoking habit among nursing and physiotherapy students at the University of Balearic Islands in Spain. *Int Nurs Rev.* 2009;56:95–101.
32. Rogers EM. Diffusion of innovations. 5th ed. New York: Free Press; 2003.
33. WHO. WHO policy recommendations: protection from exposure to second-hand tobacco smoke 2007. (Accessed 07/25/2007.) Available at: [http://www.who.int/tobacco/resources/publications/wntd/2007/who\\_protection\\_exposure\\_final\\_25June2007.pdf](http://www.who.int/tobacco/resources/publications/wntd/2007/who_protection_exposure_final_25June2007.pdf).
34. Harris KJ, Stearns JN, Kovach RG, et al. Enforcing an outdoor smoking ban on a college campus: effects of a multicomponent approach. *J Am Coll Health.* 2009;58:121–6.
35. Pardavila-Belio MI, García-Vivar C, Marcal-Pimenta A, et al. Intervention study for smoking cessation in Spanish college students: pragmatic randomized controlled trial. *Addiction.* 2015;10:1676–83.